

JOINT

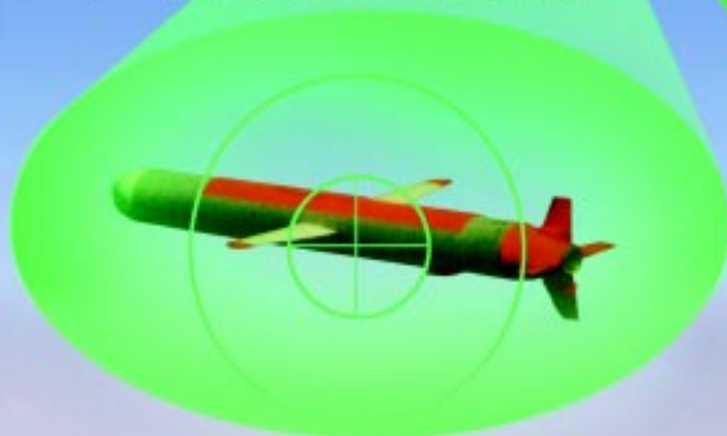
LAND ATTACK CRUISE MISSILE DEFENSE

ELEVATED

NETTED

SENSOR SYSTEM

JLENS





DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND

8 April 1998

For four decades the Army has led our Nation in space and missile defense. Today, the U.S. Army Space and Missile Defense Command, the recipient of this legacy, is preparing to lead Army efforts in joint space and missile defense into the 21st Century.

To ensure our Nation is prepared to meet the technological challenges posed by the evolving land attack cruise missile threat, the command is developing the Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System (JLENS).

This pamphlet discusses today's capability to defeat threat land attack cruise missiles; explores the complexity of the problem; describes how JLENS is a key part of the joint service solution for land attack cruise missile defense; and highlights both our implementation strategy and the challenges ahead.

EDWARD G. ANDERSON III
Lieutenant General, USA
Commanding

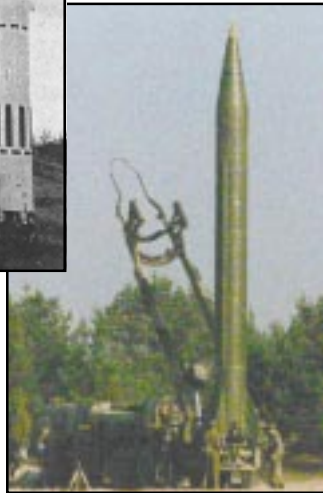


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Proliferation Of Threat Missiles

Worldwide Theater Ballistic Missile Threat



The rapid proliferation of theater ballistic missiles continues throughout many industrialized and third world countries. Missile technology ranges from the older SCUD-type class of missiles to the modern, extremely accurate M-9 and M-11 missiles. All serve as ideal delivery systems for weapons of mass destruction and many are capable of dispensing unitary and submunition warheads.

World Wide Cruise Missile Threat

Cruise missiles are developing into the weapon of choice for both western and third world countries. At least 72 countries currently have cruise missiles in their arsenals. Additionally, 19 countries are producing cruise missiles and 12 are exporting them.



Intelligence sources estimate these missiles are also proliferating rapidly. For example, France has exported EXOCET missiles to over 17 countries and the French APACHE cruise missile is anticipated to be the threat cruise missile weapon of choice by the year 2000. Iran currently possesses SILKWORM missiles, and the United States has sold HARPOON missiles to more than 12 third world countries.

These cruise missiles can be delivered by land, sea or air, and are more accurate and mobile than tactical ballistic missiles — but with the same weapons of mass destruction payloads available.

Cruise Missiles Are A Challenging Threat

Cruise missiles offer the enemy numerous employment options. They typically fly a low altitude, long range flight pattern making them difficult to detect until they are at extremely close ranges. Additionally, their low altitude flight makes them very difficult to discriminate from the surrounding ground clutter. Their highly accurate command and control guidance packages make both defended assets and personnel force concentrations extremely vulnerable.

Finally, cruise missiles are attractive weapons because they are relatively inexpensive to purchase. For example, for \$50 million dollars an adversary could purchase:

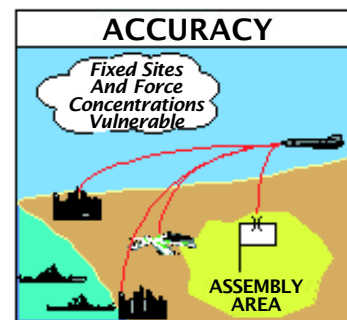
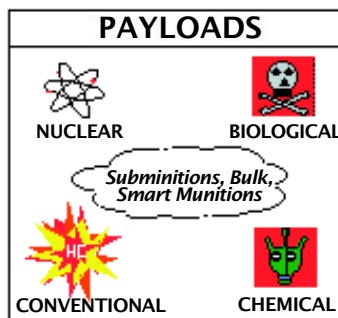
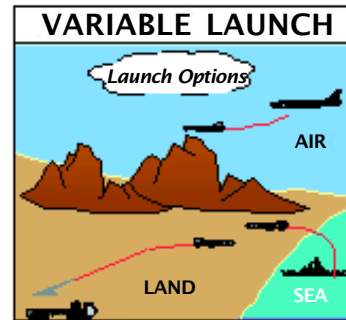
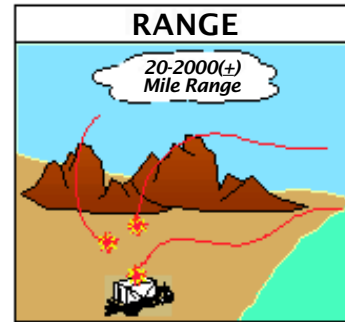
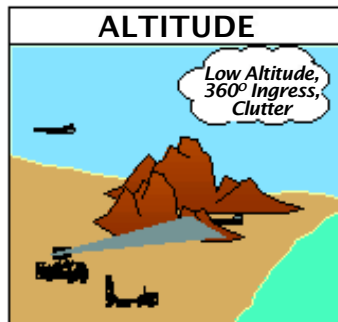
1 or 2 advanced tactical fighters, *or*

4 attack helicopters, *or*

10 utility helicopters, *or*

15 theater ballistic missiles with 3 tactical launcher platforms, *or*

100 off-the-shelf ready to fire cruise missiles, each potentially carrying a weapon of mass destruction warhead.

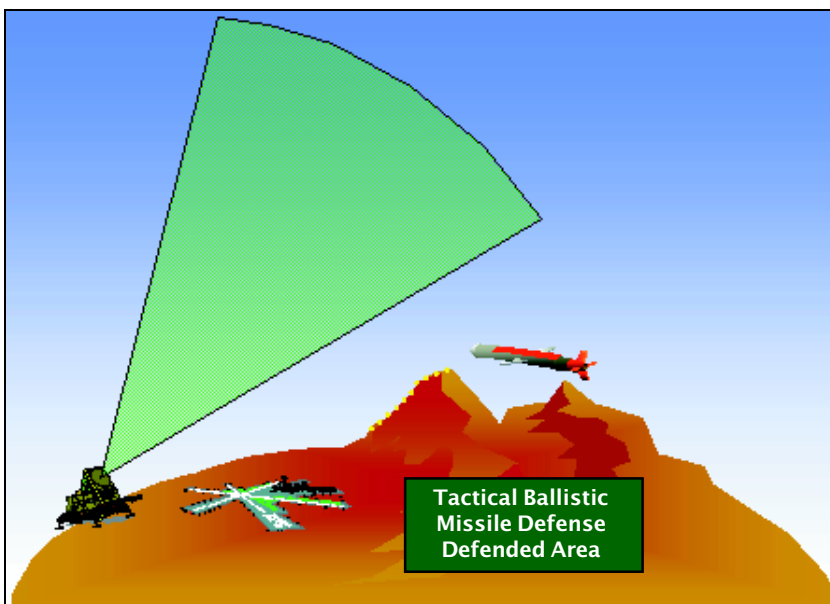


Today's Capabilities Against Land Attack Cruise Missiles

Our current joint services capability to defeat land attack cruise missiles is limited. This capability diminishes as the land attack cruise missile threat moves inland, since the theater commander loses assistance from naval ships positioned along coastal areas. Additionally, the United States Air Force, while unquestionably the best air force in the world against fixed-wing aerial threats, possesses a limited capability against low-flying land attack

cruise missiles.

Consequently, the U.S. Army Patriot air defense missile system currently serves as the primary air defense system tasked with defeating land attack cruise missiles. Patriot, however, has other missions. Among them is tactical ballistic missile defense, which in the aftermath of the Gulf War, has evolved into its primary mission. When Patriot is emplaced for tactical ballistic missile



defense of assets within its defended area, it cannot provide adequate protection against low-flying threats such as land attack cruise missiles.

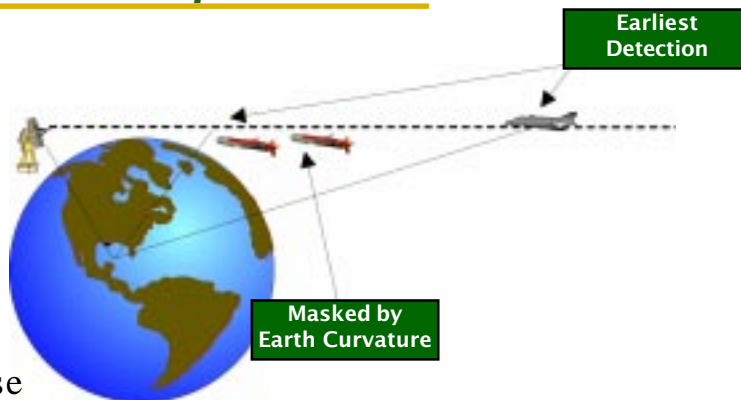
The end result is land attack cruise missiles can attack with little-to-no warning leaving all friendly elements susceptible to this threat. If the enemy chooses to employ weapons of mass destruction, such as biological, chemical, or nuclear warheads, the results could be disastrous.

Joint Land Attack Cruise Missile Defense Is Hard To Accomplish

Why LACMD is Hard

As we modernize our existing systems and capabilities, the most pressing technical issue is the need to detect and track land attack cruise missiles at the maximum range

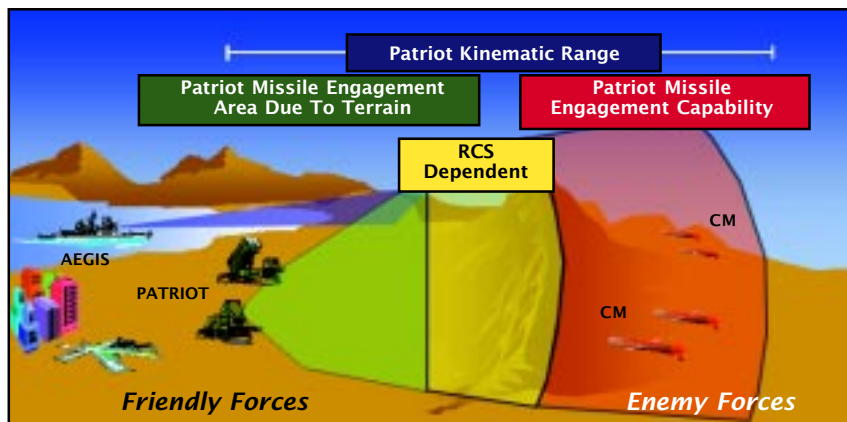
of our joint service weapon systems. Unfortunately, the detection of small targets at long ranges is extremely difficult. For example, a threat missile approaching 50 meters above the surface cannot be detected by a surface based sensor until it is within 37 kilometers of the detecting sensor because of the curvature of the earth.



	Target Altitude	Line of Sight Range (Km)
Aircraft	20,000 ft	330
	10,000 ft	240
	5,000 ft	170
CMs	200 m	67
	100 m	50
	50 m	37

The Problem with Land Attack Cruise Missiles

The cruise missile's decreasing electronic signature and its ability to attack from any angle forces land-based weapon systems to collocate with the assets they are defending in order to provide 360 degree defense protection. Consequently, land-based weapons are usually limited to very short range 'pop-up' engagements.

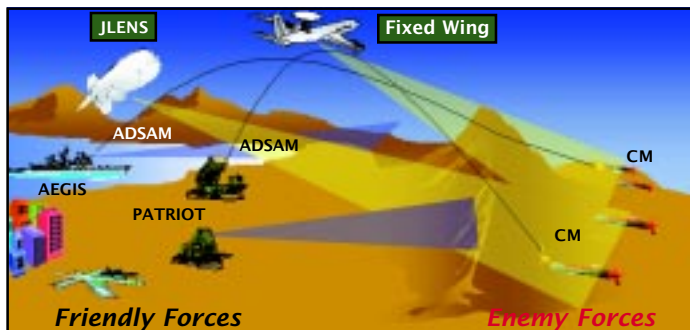


Improving Joint Land Attack Cruise Missile Defense

Elevated Sensors

As a result of this evolving threat, the Congress, OSD, the Joint Staff and BMDO believe only a joint service solution will provide adequate force protection for our military personnel.

In recognition of this need the Joint Staff, with Congressional approval, created the Joint Theater Air and Missile Defense Organization (JTAMDO) in March 1996. One of its missions is to develop effective concepts for land attack cruise missile defense.



Since the threat will likely fly at low altitudes to avoid detection by surface-based weapon systems, one possible solution is to elevate the sensors and integrate them with surface-based weapon systems. Elevation of the sensors affords the warfighter the ability to look

down at the battlefield at extended ranges unhampered by terrain masking or earth curvature. Additionally, the information provided by elevated sensors will be distributed simultaneously to all the joint theater air and missile defense weapons on the battlefield. This would provide a single integrated air picture for the warfighters negating the advantages associated with low altitude flight approach.

Indeed the JTAMDO operational vision for 2010 prescribes the use of elevated surveillance and precision tracking sensors, and the combination of all surface and air based sensor data into a single integrated air picture. This would allow over-the-horizon (OTH) detection, classification, identification tracking and engagement of threat land attack cruise missiles. Achieving an elevated fire control quality sensor may also make it possible to conduct air directed missile engagements. This new capability affords each weapon system in the joint family of theater air and missile defense systems the opportunity to achieve intercepts at the maximum effective kinematic range of its interceptors. This

capability does not exist today because of sensor line-of-sight constraints created by terrain masking and curvature of the earth.

JLENS is also a critical element of the U.S. Navy's emerging land attack cruise missile architecture. Specifically, JLENS will enable the U.S. Navy to achieve over land cruise missile defense in the littoral areas by providing surveillance, combat identification and precision tracking required for Standard Missile Block II engagements.

Achieving The Joint Solution

The Office of the Secretary of Defense and the Joint Staff selected JLENS as a cost effective technology solution against land attack cruise missiles and directed the Army to function as the lead service for JLENS development. JLENS will be positioned by the commander and dedicated to the weapon systems under his command. JLENS'

long mission duration capability will provide the extended sensor range and track quality required for ground-based systems to engage at maximum ranges and intercept incoming cruise missiles at the

first possible intercept opportunity, even over enemy territory.

● = Best
● = Good

	<i>Fixed Wing</i>	<i>JLENS</i>	<i>COMBINATION</i>
<i>Deployability</i>	●	●	●
<i>Extended Time on Station</i>	●	●	●
<i>Combat Survivability</i>	●	●	●
<i>Weatherability</i>	●	●	●
<i>Life Cycle Cost</i>	●	●	●
<i>System Affordability</i>	●	●	●

JLENS will complement fixed-wing sensor system capabilities and serve as a key member of a joint service theater air defense architecture which capitalizes upon the synergism delivered by the integrated use of these systems.

System Parameters

JLENS will operate at altitudes between 10,000 and 15,000 feet; be capable of detecting long range, terrain masked targets; and provide an effective fire control solution for joint theater air and missile defense weapon systems. Additionally, it can operate from sites on both land or sea, and is tactically relocatable. Compare these capabilities against the performance of our current sensor systems and the value added of JLENS is readily apparent.

To maximize the JLENS contribution to land attack cruise missile defense, Cooperative Engagement Capability (CEC), initially developed by the U.S. Navy is being incorporated into the JLENS systems design. JLENS with CEC offers the commander a significant new capability in air defense operations by distributing sensor and weapon data from existing systems in a significantly different manner. This new capability offers dramatic benefits in track accuracy, continuity, and consistency of target identification; provides an identical picture to all CEC equipped units; increases battlespace, reduces reaction time, and extends engagement ranges through cooperative engagements. The Army, Navy and Air Force are working together in the development and implementation of this aspect of the JLENS program.

Characteristics

<i>Functions</i>	<i>Capabilities</i>
<i>Surveillance Range</i>	<i>Up to 320 Km</i>
<i>Fire Control Range</i>	<i>Up to 250 Km</i>
<i>Combat Identification</i>	<i>Yes</i>
<i>Altitude</i>	<i>Up to 15,000 ft</i>
<i>Battle Management and BM/C4I</i>	<i>JTIDS and CEC Capability</i>
<i>Basing</i>	<i>Land or Sea</i>
<i>Mobility</i>	<i>Fixed and Tactically Relocatable Sites</i>

JLENS Is All Weather

Weather is a factor for any airborne system. JLENS, however, is being designed to remain aloft and operate in the full spectrum of militarily significant aviation weather. To highlight the impact of weather upon an aerial platform let us consider two very different climatic areas of the world, Kuwait and Korea. Weather conditions in Kuwait are normally stable, hot and dry. Weather conditions in the Republic of South Korea are frequently changing, and widely divergent in temperature extremes. Thus, expected performance for airborne systems varies significantly between these two areas.

An older generation JLENS platform (Aerostat) has been operating in Kuwait for several years, and has consistently maintained an operational availability rate averaging 90%. However, recently completed studies indicate the same older generation Aerostat based platform would not perform as well in the Republic of South Korea because of expected adverse weather conditions. To mitigate these differences the JLENS program is incorporating state of the art sensing and predicting instrumentation into all future design developments. These instruments include on-board cameras, ice accretion sensor and de-icing equipment, lightning prediction and detection equipment, a three axis anemometer, and a wind profiler sensor capability radar. These modifications are expected to increase the platform's performance rate by at least 20%, resulting in 90% operational availability rates on a world-wide basis.

JLENS Is Survivable

To ensure JLENS can survive in stressing combat environments, initial engineering analyses have been completed to address this issue. These studies and analyses have evaluated JLENS against the full range of enemy air and ground threats, both against the airborne platform and the ground station.

●	Very Low or Negligible
●	Low Risk
A=	Air Platform
G=	Ground
R=	Radar
*	Further Analysis or Testing Required

Term	Assessment With Survivability Measures																
	Air Delivered											Surface Delivered	SOF Terrorists				
Analysis or required	IR Missile	RF Missile (D)	RF Missile (ND)	Smart Bomb/Msl	IR, TV, Laser	Gun	Iron Bomb	Smart Bomb/Msl	IR, TV, Laser	Gun	Arm	Jammer	SAM (HIMAD)	TBM	Manpads	Direct/Indirect Fire	DEW
	Air Platform						Ground			Radar	A	G	A	G	R		
Weapon	●*	●	●*	●*	●	●	●	●	●	●	●*	●	●	●	●	●	●
Target																	
Preliminary Assessment	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

The studies concluded that J L E N S survivability is equal with all other sensors on the battle-field. For example, all sensors are susceptible to enemy jamming efforts, and JLENS, like

any other sensor, could be negatively affected by terrorist activities if physical security were not adequately maintained. However, use of appropriate survivability measures, such as attainment of U.S. air superiority, deployment with Patriot and THAAD, employment with friendly elements, and execution of planned system improvements, will ensure JLENS achieves high survivability rates.

JLENS Increases Battlespace

As previously mentioned, surface-based joint air defense sensors currently experience line-of-sight problems due to terrain masking, which in turn significantly reduces the effective battlespace. When the surface-based sensors are optimized for defense against tactical ballistic missiles, which is the current common practice, the impact is even more dramatic. For example, a Patriot air defense sensor emplaced for tactical ballistic missile defense has a limited ability to see and engage a target approaching at an elevation of 100 meters above ground level. However, that same Patriot sensor when provided JLENS sensor surveillance and fire control information, is able to increase its effective battlespace by over 700 percent. The result is a significantly reduced risk for our deployed personnel and equipment, and allies and coalition partners.

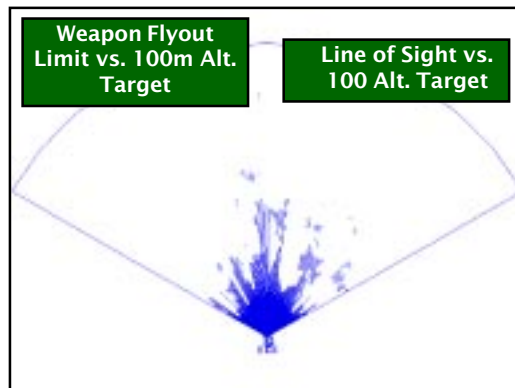
The Joint Chiefs of Staff (J8) *Land Attack Cruise Missile Defense Study*, and the Defense Science Board's *Task Force on Land Attack Cruise Missile Defense* both confirm that JLENS provides the commander with:

- Achievement of a single integrated air picture shared by all theater air and missile defense assets;
- Increased battlespace;
- Improved situational awareness;
- Improved combat identification;
- Round the clock surveillance and tracking at significantly reduced operating costs.

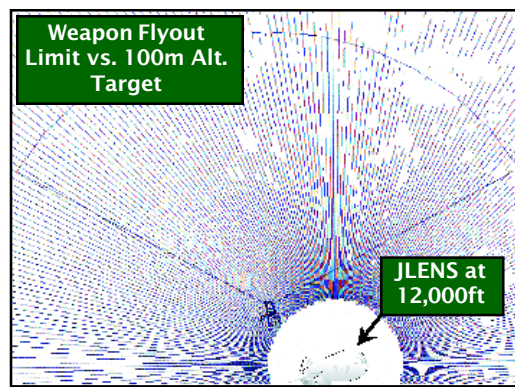
JLENS Offers Over-The-Horizon Capabilities

An additional benefit of JLENS is its ability to facilitate extended range communications; detect both friendly and enemy ground moving targets; and otherwise assist in deep attack operations. JLENS will report this critical information to command and control centers such as the Army's Air and Missile Defense Command and the Joint Force Air Component Commander's Air Operation Center (AOC).

Patriot Capability Without JLENS



Patriot Capability With JLENS



Implementation

Current schedules envision the initial JLENS prototype beginning development and testing in the year 2000, with an initial 'ready to go to war' capability by 2002. JLENS full capability design will be completed by the year 2005.

We Must Do This

The Defense Intelligence Agency (DIA) and Central Intelligence Agency (CIA) believe the cruise missile threat is real, sophisticated, evolving, and dangerous. JLENS will meet this expected 2010 threat.

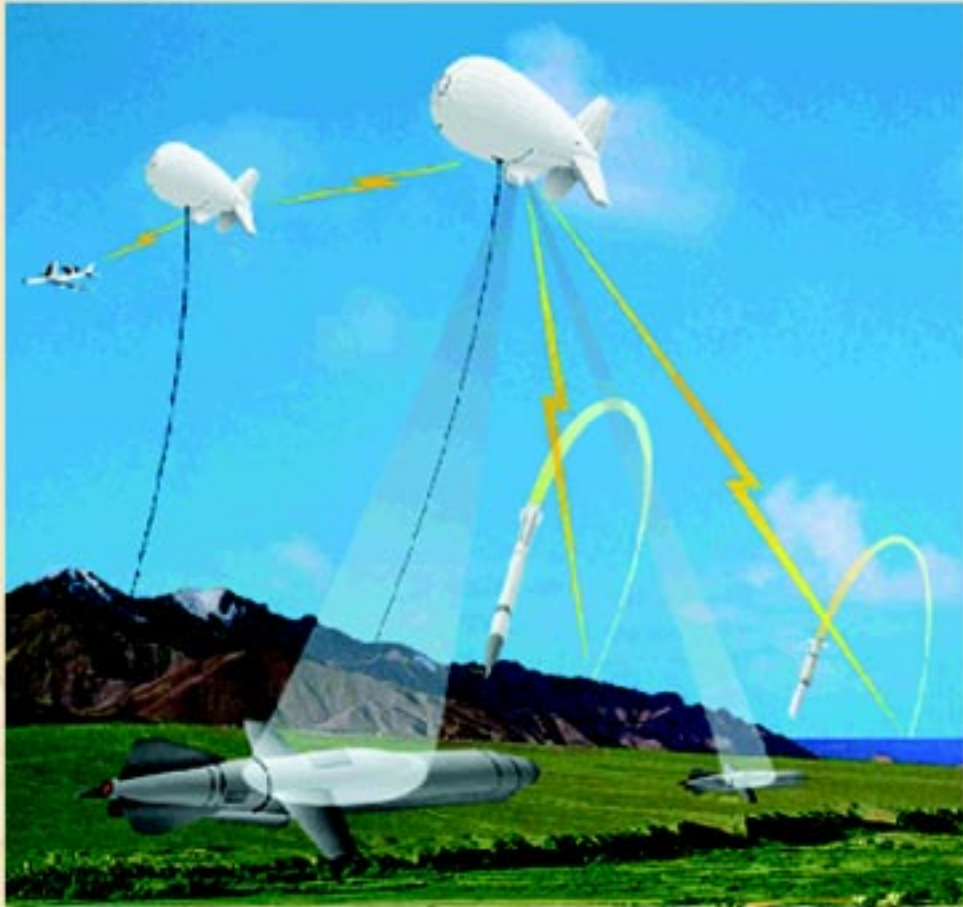
Our current joint land attack cruise missile defense capability is limited. JLENS, in conjunction with planned joint services fixed wing sensor platforms, offers the best solution to effective land attack cruise missile defense.

JLENS is the only joint system currently being designed specifically against the growing land attack cruise missile threat. JLENS extends the battle space against these dangerous threat missiles.

JLENS is key to force protection on tomorrow's joint battlefield, not only for our forces and equipment but for our allies and coalition partners as well.

Our Challenge

There are some challenges ahead, balancing progressive innovation with affordable budgetary requirements, orchestrating broad-based joint service efforts, and developing superior system engineering programs which ensure JLENS meets the full spectrum of warfighting requirements. There is a lot to do, but it can and must be done. JLENS success is critical to achieving defense against land attack cruise missiles.



***“I’ve spent most of my career wondering
what was on the other side of the hill.”***

Duke of Wellington



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